(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 001 491 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.05.2022 Bulletin 2022/21

(21) Application number: **21205136.1**

(22) Date of filing: **28.10.2021**

(51) International Patent Classification (IPC):
D06F 34/34 *(2020.01)* ***D06F 34/32*** *(2020.01)*
D06F 34/30 *(2020.01)* *H03K 17/96* *(2006.01)*
D06F 34/28 *(2020.01)*

(52) Cooperative Patent Classification (CPC):
D06F 34/32; D06F 34/34; A47L 15/4293; D06F 34/28; D06F 34/30; H03K 17/962

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **17.11.2020 TR 202018358**

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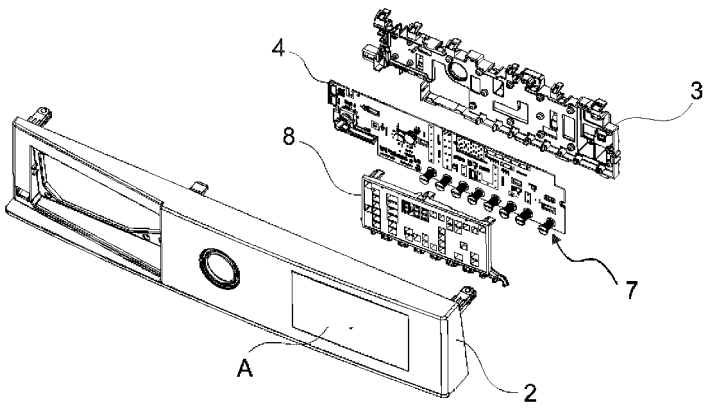
(54) **A HOUSEHOLD APPLIANCE COMPRISING TOUCH BUTTON**

(57) The present invention relates to a household appliance (1) comprising a control panel (2) having a control area (A) thereon which enables the user to select the desired program parameters by touching; a circuit board (4) which is disposed behind the control panel and which is placed onto a board holder (3); at least one touch button (7) having a plate (6) bearing against the control area (A) and at least one spring (5) one end of which is fixed to the plate (6) and the other end to the circuit board (4) and which transmits to the circuit board (4) the capacitive difference forming when the control area (A) is touched; and a separator (8) which is placed onto the circuit board (4) so as to remain between the circuit board (4) and the control panel (2).

Figure 2



EP 4 001 491 A1

Description

[0001] The present invention relates to a household appliance comprising a touch button provided on the control panel.

[0002] In household appliances, touch buttons are preferred to be used on control panels due to their ease of use and aesthetic appearances. The most used of the detection methods for detecting the contact of the user in the touch buttons is detection of the capacitive change by means of springs connected to the circuit board, which have a plate at the ends thereof that contact the control area. One of the most common problems encountered in this type of touch buttons the deformation of the spring fixed to the circuit board in connection errors that occur during the mounting of the circuit board to the control panel or the control panel to the household appliance. In this case, the plate fixed to the spring cannot be aligned with the control area on the control panel, problems such as sensitivity change, wrong key detection occur, and the user cannot control the household appliance as desired by using the control panel. In the state of the art various embodiments are available in order to fix the position of the spring. In one of these embodiments, guides surrounding the spring are placed onto the circuit board. However, this embodiment cannot be utilized when the spring is positioned at a point close to the edge of the circuit board. In another state of the art embodiment, the springs are guided to each other by being surrounded with components assembled thereafter. However, this embodiment is disadvantageous in that the assembly thereof is laborious and time consuming. Another disadvantage of this embodiment is that the buttons get stuck when two components cannot be properly seated or aligned.

[0003] The state of the art European Patent Application No. EP2920348 discloses a cover which is mounted to the board holder and which has a first member thereon, and a guide which is attached onto the cover and which has a second member joining with the first member and forming a housing.

[0004] In the state of the art European Patent Application No. EP2773804, a two-piece guide is disclosed, which is fixed to the circuit board so as to surround the spring from under the plate.

[0005] The aim of the present invention is the realization of a household appliance wherein the control panel with touch button is mounted in a quick and easy manner.

[0006] The household appliance realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a control panel having a control area designated for the user to touch; a circuit board which is placed on a board holder positioned behind the control panel; a touch button having at least one spring which transmits the capacitive difference that forms by the user touching the designated control area and a conductive plate situated between the control panel and the spring and that is mounted to the upper end of the spring; and a separator which is placed onto the circuit board so as to remain between the circuit board and the control panel.

[0007] The household appliance of the present invention comprises a second support which is provided on the board holder and which extends towards the spring such that almost no gap remains between the spring and the second support when the circuit board is attached to the board holder; and a first support which is provided on the edge of the separator facing the spring, which remains at the other side of the spring such that almost no gap remains between the spring and the first support when the separator is placed onto the circuit board and which is positioned opposite to the second support. The spring extends so as to compress and stretch inside the gap between the first support and the second support, which is a little wider than the diameter of the spring. Thus, the first support and the second support bear against the spring during the assembly, preventing the oscillation and bending movement of the spring. Thus, the safety of the spring during the assembly is ensured in a simple manner, and the assembly time is shortened. Another advantage of this embodiment is that cost advantage is provided since no guiding component is used.

[0008] In an embodiment of the present invention, the board holder has at least one skirt portion which extends perpendicularly to the circuit board and whereon the edge of the circuit board is seated, and the second support is configured as an extension which is arranged on the skirt and which extends towards the spring. This embodiment is advantageous in that the second support is enabled to be configured depending on the position of the touch button without requiring any change in the geometry of the board. Thus, the length of the second support can be adjusted according to the distance from the touch button to the edge of the board.

[0009] In another embodiment of the present invention, the second support has a resting portion which bears against the circuit board, and a guiding portion which extends in the stretching-compressing direction of the spring so as to almost contact the spring. Thus, the second support is enabled to serve in the fixing of the circuit board to the board holder, providing a safer and quicker assembly.

[0010] In another embodiment of the present invention, the first support is in the form of a semicircle having a diameter a little larger than the diameter of the spring. Thus, the first support is enabled to support the spring both towards the separator and the sides.

[0011] In another embodiment of the present invention, a first protrusion, a second protrusion and a third protrusion are successively positioned at 90-degree arc intervals on the inner portion of the semicircular first support facing the spring, the end portions thereof and the central portion thereof. When the separator is placed onto the circuit board, the second protrusion at the center and the first support are aligned. The production tolerances are balanced by means of the protrusions, and the spring is

safely supported from all sides during the assembly.

[0012] In another embodiment of the present invention, the first support and the second support have a height smaller than the spring so as to remain under the plate. Thus, the circuit board is enabled to be easily placed onto the board holder and the separator on the circuit board such that the assembly is facilitated.

[0013] In another embodiment of the present invention, the plate has a surface wider than the distance between the first support and the second support so as to bear against the first support and the second support from above when the spring is compressed. Thus, the plate is prevented from entering and getting stuck between the first support and the second support, and the compression of the spring is limited when the user applies excessive force onto the control area such that the touch button is prevented from operating erroneously.

[0014] In another embodiment of the present invention, the separator has a plurality of housings which surround and enclose a plurality of light sources when the separator is placed onto the circuit board, serving as a reflector, so as to physically separate a plurality of light sources and/or screens provided on the circuit board. This embodiment is advantageous in that ease of placement is provided when the light sources and/or screens are positioned closed to the touch buttons on the circuit board.

[0015] In another embodiment of the present invention, the household appliance is a laundry washing machine or a laundry drying machine.

[0016] By means of the present invention, connection errors which are caused by the failure to align the touch button with the control area during the assembly are eliminated in a simple manner with any additional costs.

[0017] The household appliance realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1- is the perspective view of a household appliance of the present invention.

Figure 2 - is the exploded view of the control panel, the separator, the circuit board and the board holder related to an embodiment of the present invention.

Figure 3 - is the assembled view of the control panel, the separator, the circuit board and the board holder related to an embodiment of the present invention.

Figure 4 - is the view of the separator related to another embodiment of the present invention.

Figure 5 - is the view of the board holder related to another embodiment of the present invention.

Figure 6 - is the sideways cross-sectional view of the control panel, the separator, the circuit board and the board holder related to an embodiment of the present invention.

Figure 7 - is the sideways partial cross-sectional view of the separator, the circuit board and the board holder related to an embodiment of the present invention.

[0018] The elements illustrated in the figures are numbered as follows:

1. Household appliance
2. Control panel
3. Board holder
4. Circuit board
5. Spring
6. Plate
7. Touch button
8. Separator
9. First support
10. Second support
11. Resting portion
12. Guiding portion
13. First protrusion
14. Second protrusion
15. Third protrusion
16. Skirt
17. Light source
18. Housing
19. Slot
20. Embossment

A: Control area

[0019] The household appliance (1) comprises a control panel (2) having a control area (A) thereon which enables the user to select the desired program parameters by touching; a circuit board (4) which is disposed behind the control panel and which is placed onto a board holder (3); at least one touch button (7) having a plate (6) bearing against the control area (A) and at least one spring (5) one end of which is fixed to the plate (6) and the other end to the circuit board (4) and which transmits to the circuit board (4) the capacitive difference forming when the control area (A) is touched; and a separator (8) which is placed onto the circuit board (4) so as to remain between the circuit board (4) and the control panel (2). The end of the spring, which is not connected to the circuit board (4), is connected to the conductive plate (6). When the user moves his/her finger near or touches the control area (A) on the control panel (2) designated for touching, a capacitance is formed between the plate (6) and the point where his/her finger is. The electrical effect generated by the capacitive difference is transmitted to the circuit board (4) designed to detect the capacitance difference by means of the spring (5). The circuit board (4) detects that the button is touched and determines the relevant command entered by the user, and operates the functions of the household appliance (1) depending on these commands.

[0020] The household appliance (1) of the present invention comprises at least one first support (9) which is provided on the separator (8) and which is positioned so as to face the spring (5); and at least one second support (10) which is provided on the board holder (3) and which is positioned opposite to the first support (9) such that the spring (5) remains between the first support (9) and

the second support (10) almost without any gap. When the circuit board (4) is placed onto the board holder (3), the second support (10) aligns with the the spring (5). Likewise, when the separator (8) is placed onto the board holder (3), the first support (9) aligns with the second support (10) and the spring (5). Thus, the spring (5) is trapped between the first support (9) and the second support (10), and is prevented from moving in directions other than the direction of stretching-compressing. Thus, the spring (5) is provided to remain at the initial position given by the producer.

[0021] In an embodiment of the present invention, a skirt (16) extending from one edge of the board holder (3) towards the control panel (2) is provided on the board holder (3), and the second support (10) is arranged on the skirt (16). The board holder (3) comprises a skirt (16) which at least partially surrounds the edge of the circuit board (4) and which extends almost perpendicularly to the circuit board (4), and the second support (10) is arranged on the skirt (16) so as to extend towards the front side of the circuit board (4) whereon the touch button (7) is disposed. Thus, the circuit board (4) can be easily placed onto the board holder (3).

[0022] In another embodiment of the present invention, the second support (10) has a resting portion (11) which bears against the front surface of the circuit board (4) facing the control panel (2), and a guiding portion (12) which extends almost parallel to the spring (5). The second support (10) has a resting portion (11) which extends parallel to the front surface of the circuit board (4) whereon the touch button (7) is disposed, and a guiding portion (12) which extends almost perpendicularly to the resting portion (11) in the stretching-compressing direction of the spring (5). In case the second support (10) is arranged on the skirt (16), a slot (19) suitable for receiving the edge of the circuit board (4) is provided between the board holder (3) and the resting portion (11). The circuit board (4) is slidably attached to the board holder (3) such that the edge thereof remains inside the slot (19). In a preferred version of this embodiment, at least one embossment (20), which supports the circuit board (4) from behind towards the resting portion (11), is arranged on the board holder (3). Thus, the circuit board (4) is enabled to be properly seated onto the board holder (3) such that the spring (5) and the second support (10) are always aligned correctly and the assembly errors are eliminated.

[0023] In another embodiment of the present invention, the first support (9) is almost in the form of a semicircle. The first support (9) is configured in the form of a semicircle so as to surround one half of the spring (5). The second support (10) is aligned so as to center the first support (9). Thus, the spring (5) is enabled to be supported almost at all sides.

[0024] In another embodiment of the present invention, the first support (9) has a first protrusion (13) which is positioned opposite to the second support (10), and a second protrusion (14) and a third protrusion (15) which are opposite to each other on the first support (9). The semicircular first support (9) is suitable for supporting the spring (5) from three directions by means of the second protrusion (14) and the third protrusion (15) provided at two ends thereof and the first protrusion (13) which is positioned at the center thereof so as to be at equal distance to the second protrusion (14) and the third protrusion (15) and aligned with the first support (9). Thus, while being placed onto the circuit board (4), the separator (8) is enabled to be easily aligned with respect to the spring (5) and the board holder (3).

[0025] In another embodiment of the present invention, the heights of the first support (9) and the second support (10) are smaller than the free height of the spring (5). Thus, a distance sufficient for the spring (5) to stretch a little remains between the plate (6) and the first support (9) and the second support (10), and when the control panel (2) is seated onto the plate (6), the spring (5) is stretched in the direction of compressing, and the plate (6) is enabled to get into full contact by means of the spring (5) applying pressure to the control panel (2) from below.

[0026] In another embodiment of the present invention, the plate (6) has a surface area larger than the diameter of the spring (5) so as to be prevented from entering between the first support (9) and the second support (10). The first support (9) and the second support (10) surround the spring (5) from under the plate (6). Thus, when the spring (5) is compressed during the assembly, the first support (9) and the second support (10) are enabled to support the plate (6) from below, and the touch button (7) is prevented from getting damaged.

[0027] In another embodiment of the present invention, a plurality of light sources (17) are provided on the circuit board (4), and the separator (8) has a plurality of housings (18) which surround the light sources (17) so as to separate the light sources (17) from each other. This embodiment is advantageous in that the light sources (17) and the touch buttons (7) are allowed to be positioned close to each other.

[0028] In another embodiment of the present invention, the household appliance (1) is a laundry washing machine or a laundry drying machine.

[0029] By means of the present invention, the springs (5) are prevented from getting deformed during the assembly in a simple and cost-effective manner.

Claims

1. A household appliance (1) comprising a control panel (2) having a control area (A) thereon which enables the user to select the desired program parameters by touching; a circuit board (4) which is disposed behind the control panel (2) and which is placed onto a board holder (3); at least one touch button (7) having a plate (6) bearing against the control area (A) and at least one spring (5) one end of which is fixed to the plate (6) and the other end to the circuit board

(4) and which transmits to the circuit board (4) the capacitive difference forming when the control area (A) is touched; and a separator (8) which is placed onto the circuit board (4) so as to remain between the circuit board (4) and the control panel (2), **characterized by**

- at least one first support (9) which is provided on the separator (8) and which is positioned so as to face the spring (5); and
- at least one second support (10) which is provided on the board holder (3) and which is positioned opposite to the first support (9) such that the spring (5) remains between the first support (9) and the second support (10) almost without any gap.

2. A household appliance (1) as in Claim 1, **characterized by** a skirt (16) which is provided on the board holder (3) and which extends from one edge of the board holder (3) towards the control panel (2), and the second support (10) which is arranged on the skirt (16).

3. A household appliance (1) as in Claim 1 or Claim 2, **characterized by** the second support (10) having a resting portion (11) which bears against the front surface of the circuit board (4) facing the control panel (2), and a guiding portion (12) which extends almost parallel to the spring (5).

4. A household appliance (1) as in any one of the above claims, **characterized by** the first support (9) which is almost in the form of a semicircle.

5. A household appliance (1) as in Claim 4, **characterized by** a first protrusion (13) which is positioned on the first support (9) opposite to the second support (10), and a second protrusion (14) and a third protrusion (15) which are opposite to each other on the first support (9).

6. A household appliance (1) as in any one of the above claims, **characterized by** the first support (9) and the second support (10) the heights of which are smaller than the free height of the spring (5).

7. A household appliance (1) as in Claim 6, **characterized by** the plate (6) having a surface area larger than the diameter of the spring (5) so as to be prevented from entering between the first support (9) and the second support (10).

8. A household appliance (1) as in any one of the above claims, **characterized by** a plurality of light sources (17) which are provided on the circuit board (4), and the separator (8) having a plurality of housings (18) which surround the light sources (17) so as to separate the light sources (17) from each other.

9. A household appliance (1) as in any one of Claim 1 to Claim 8, which is a laundry washing machine or a laundry drying machine.

Figure 1

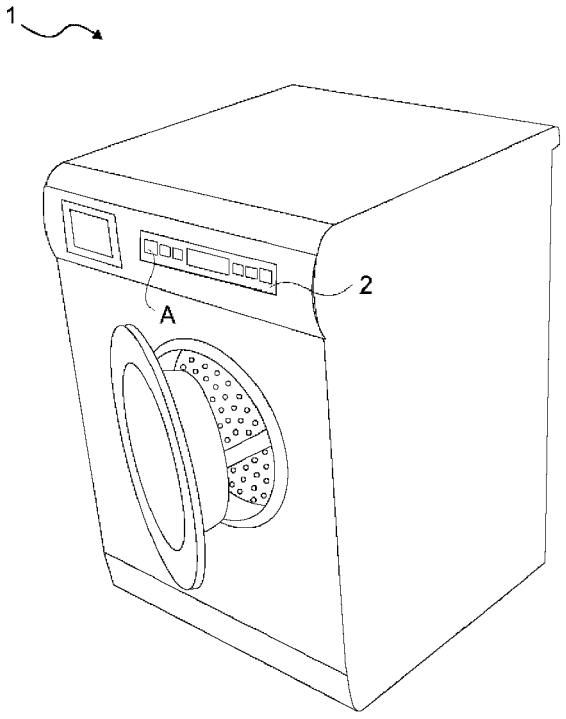


Figure 2

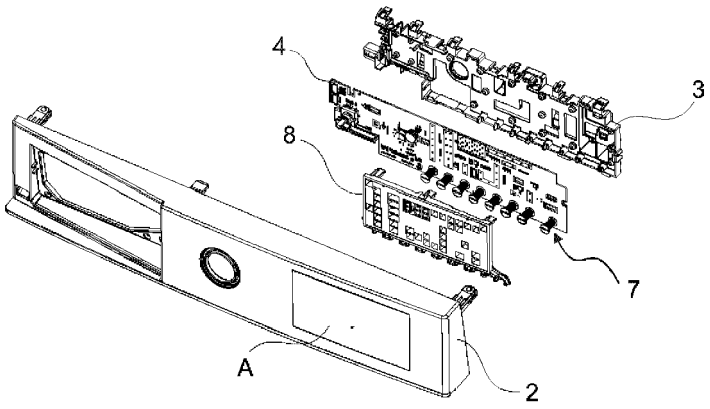


Figure 3

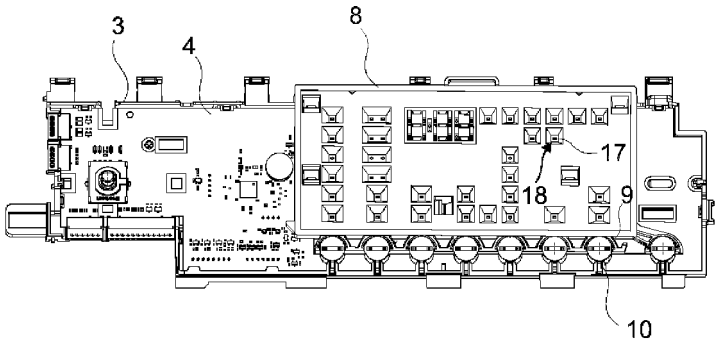


Figure 4

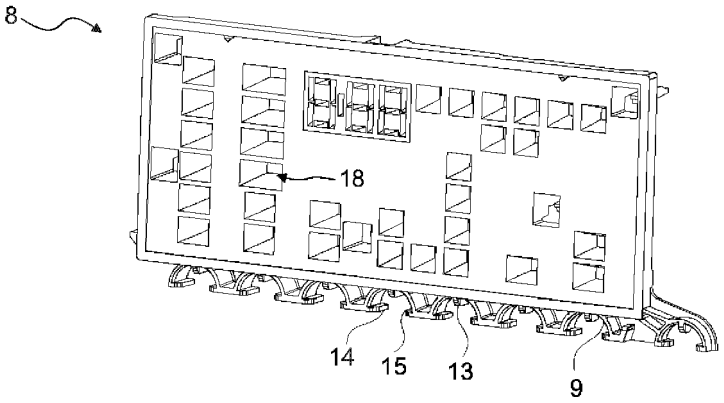


Figure 5

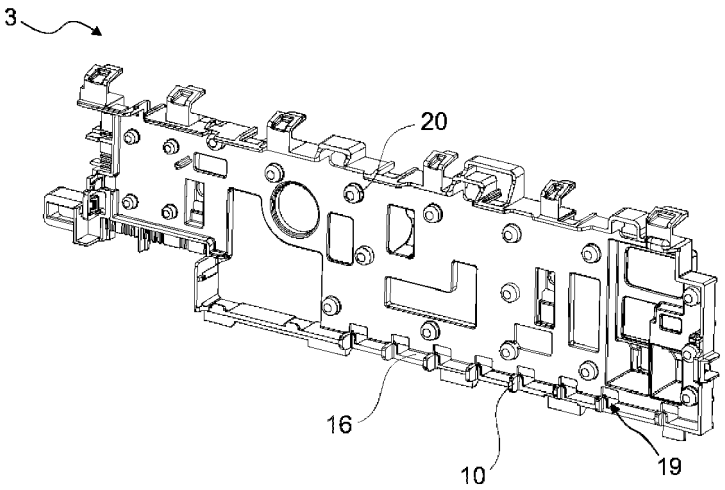


Figure 6

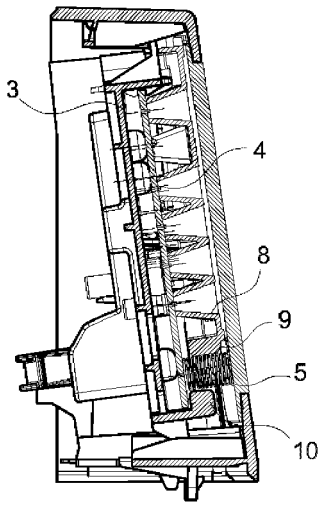
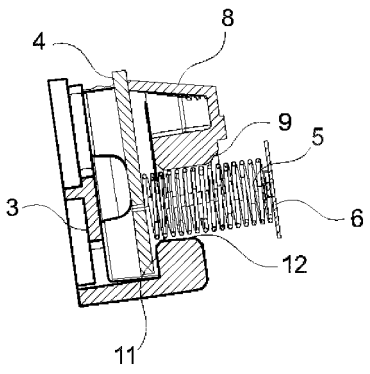


Figure 7



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EUROPEAN SEARCH REPORT

Application Number
EP 21 20 5136

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	WO 2017/114625 A1 (ARCELIK AS [TR]) 6 July 2017 (2017-07-06) * paragraph [0030]; figures 2-4 *	1-9	

TECHNICAL FIELDS SEARCHED (IPC)
H03K
A47L
D06F

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 March 2022	Diaz y Diaz-Caneja

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17-03-2022

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